

Interactive comment on “A Statistical Comparison of Cirrus Particle Size Distributions Measured Using the 2D Stereo Probe During the TC⁴, SPartICus, and MACPEX Flight Campaigns with Historical Cirrus Datasets” by M. Christian Schwartz

Anonymous Referee #2

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The material in this manuscript is suitable for publication in *amt*. It gives a useful comparison between an older particle probe, the 2DC, and the newer probe, the 2DS, thought to provide more accurate ice crystal information. A compilation of the parameterization and normalization of many ice crystal size distributions measured by both probe types is used in an attempt to adjust the older probe data to make that data more reliable.

1. The paper needs a careful review concerning the lack of definition of some given

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variables. For example, what is a_{mi} and b_{mi} in Eq. (4), what is D_{eq} in the Figures, what is subscript l ?

2. The accuracies of the density/dimension and mass/dimension relationships used in the paper are not discussed, even though they may affect the conclusions reached. A comment on such a possible affect.

3. The data for D05/D014 is listed as starting at 25 μm ; whereas the data for the 2DS starts at 15 μm . Is this taken into account in the comparisons?

4. The author points out the difficulty of the probes measuring the smallest ice crystals, given that the probes can create errors due to uncorrected crystal shattering and other reasons. His sentence associated with small crystals (line 181) “It is therefore felt that the averaging approach is justified” is inconsistent with this difficulty.

5. The paper only deals with integrated ice-crystal properties, but it also points out that the nature of the ice-crystal size distribution should also play a significant role in probe performance. The latter is not dealt with in the paper. It would be helpful for the author to comment on what might be done to improve the size information on the smallest ice crystals that can dominate under certain atmospheric conditions (e.g., Heymsfield et al., 2010, *JAS*, 67, 3303-3318). For example, can forward scattering probes that respond to small particles be used for ice crystal measurements (e.g., Gerber and DeMott, 2014, *JTECH*, 31, 2145-2155) ?

6. The impressive Appendix is not essential for the conclusions reached in the paper. Deletion of the Appendix is recommended.

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